Water Quality Standards **Discussion Paper**

A REFERENCE CONDITION METHOD FOR QUANTITATIVE APPLICATION OF THE "NATURALLY OCCURRING" STANDARD

SUMMARY

DES proposes to implement a procedure for quantitative application of the narrative standard of "none unless naturally occurring for color, turbidity, temperature, oil and grease, nitrogen, and phosphorus in class A waterbodies. The procedure would use statistical analysis of data from reference sites to determine a numerical upper limit for "naturally occurring" by waterbody type that is equal to the 75th percentile value for the population of reference sites.

BACKGROUND

DES and the Water Quality Standards Advisory Committee (WQSAC) have been considering rule changes to create a process so that water transfers from one waterbody to another can be determined to comply with water quality standards and considered for NPDES permits. A previous discussion paper (1) applies. The remaining issue to be resolved is that the "none unless naturally occurring" narrative standard for color, turbidity, temperature, oil and grease, nitrogen, and phosphorus that applies in class A waterbodies would seem to result in de facto prohibition of transfers to these waterbodies.

Options discussed by the committee include: 1) legislative reclassification of class A waterbodies to class B before a transfer can be considered; 2) changing the "none unless naturally occurring" language for color, turbidity, temperature, oil and grease, nitrogen, and phosphorus in class A waterbodies; 3) creating an exception to the "none unless naturally occurring" language that applies only to waterbodies receiving water transfers; and 4) redefining "naturally occurring"

Informal legal review by DES recommends that, because the "none unless naturally occurring" language occurs in rule and not in the legislative requirements for class A there should be a rule change that will accomplish the intended purpose of allowing water transfers to class A waterbodies, with appropriate safeguards and restrictions. Legislative reclassification is not needed or appropriate.

It was pointed out in discussions at the 3/22/2004 WQSAC meeting that creating an exception to the "none unless naturally occurring" language that applies only to waterbodies receiving water transfers would result in no standard at all for these waterbodies for these parameters, and if a different standard were adopted for these waterbodies, then a new subclass would be created, with a different ambient standard for color, turbidity, temperature, oil and grease, nitrogen, and phosphorus. DES does not want to create a new subclass.

Also at the 3/22/2004 WQSAC meeting, it was the sense of the committee that removing or changing the "none unless naturally occurring language would not be a good idea.

The remaining option is to redefine "naturally occurring". DES proposes to do this by applying a translator procedure that estimates a range of numerical values for naturally occurring color, turbidity, nitrogen, and phosphorus by waterbody type, rather than by changing the rule definition.

APPLICABLE LAWS AND REGULATIONS (Excerpts)

Env-Ws 1702.29 "Naturally occurring conditions" means conditions which exist in the absence of human influences.

Env-Ws 1703.10 Color.
(a) Class A waters shall contain no color, unless naturally occurring.

Env-Ws 1703.11 Turbidity.
(a) Class A waters shall contain no turbidity, unless naturally occurring.

Env-Ws 1703.14 Nutrients.
(a) Class A waters shall contain no phosphorus or nitrogen unless naturally occurring.

DISCUSSION

The idea of "reference condition" for waterbodies has been widely used in recent years in the development of numeric biological criteria for aquatic life use support, and has also been proposed in EPA guidance documents for development of numeric nutrient criteria. A reference condition is one in which the waterbody and its tributary watershed are minimally impacted by human activity, so that measurable attributes of water quality and aquatic life are as close as possible to conditions which would exist in the absence of human influences. A further description of the concept may be found at http://www.epa.gov/waterscience/biocriteria/alus/ref2.html.

For an identified population of reference sites, the natural variability of a water quality parameter can be estimated from the distribution of parameter values. Naturally occurring conditions, or conditions indistinguishable from naturally occurring, can then be defined as some statistic of the distribution. For example, values less than the 75th percentile of the population of parameter values might be considered to be naturally occurring. Using this procedure, water quality parameters for any waterbody would be considered to be "as naturally occurs" if they fit within the prescribed statistic of the reference population of values.

DES has conducted a preliminary analysis for lakes for color, turbidity, phosphorus, and nitrogen. A total of 60 ~~70~~ lakes for which DES has data were evaluated. Thirty were estimated

to be reference conditions, and this estimation was confirmed using GIS-based tests for human disturbance such as road density and percent developed land. For comparison, 30 ~~36~~ lakes were chosen that were estimated to have great human disturbance in their watershed. Turbidity data was available for only 13 of the 60 lakes evaluated (1 reference vs 12 non-reference). Population statistics were generated for both reference lakes and non-reference lakes (table 1). Figures 1-4 are box and whisker plots showing the same information graphically.

Table 1

	Reference					Non-Reference				
	Color	Nitrate (mg/L)	Total P (mg/L)	Turbidity (NTU)	TKN (mg/L)	Color	Nitrate (mg/L)	Total P (mg/L)	Turbidity (NTU)	TKN (mg/L)
90th Percentile	38.00	0.10	0.03	0.68	0.46	47.00	0.06	0.02	1.59	0.50
75th Percentile	20.75	0.05	0.01	0.65	0.30	35.00	0.05	0.02	1.15	0.40
25th Percentile	7.25	0.05	0.01	0.25	0.16	15.50	0.05	0.01	0.53	0.26
10th Percentile	2.50	0.02	0.00	0.24	0.11	10.00	0.02	0.01	0.41	0.17
Mean	22.00	0.05	0.01	0.42	0.25	27.00	0.05	0.01	0.92	0.34
# Observations	36	34	37	9	33	67	63	70	114	62

Figure 1

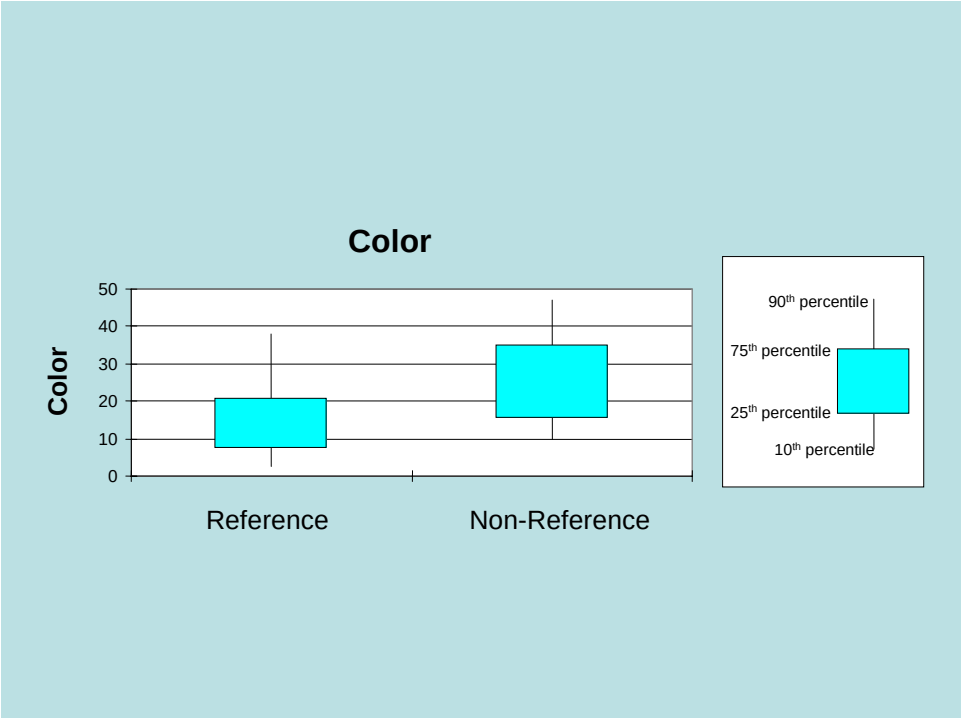


Figure 2

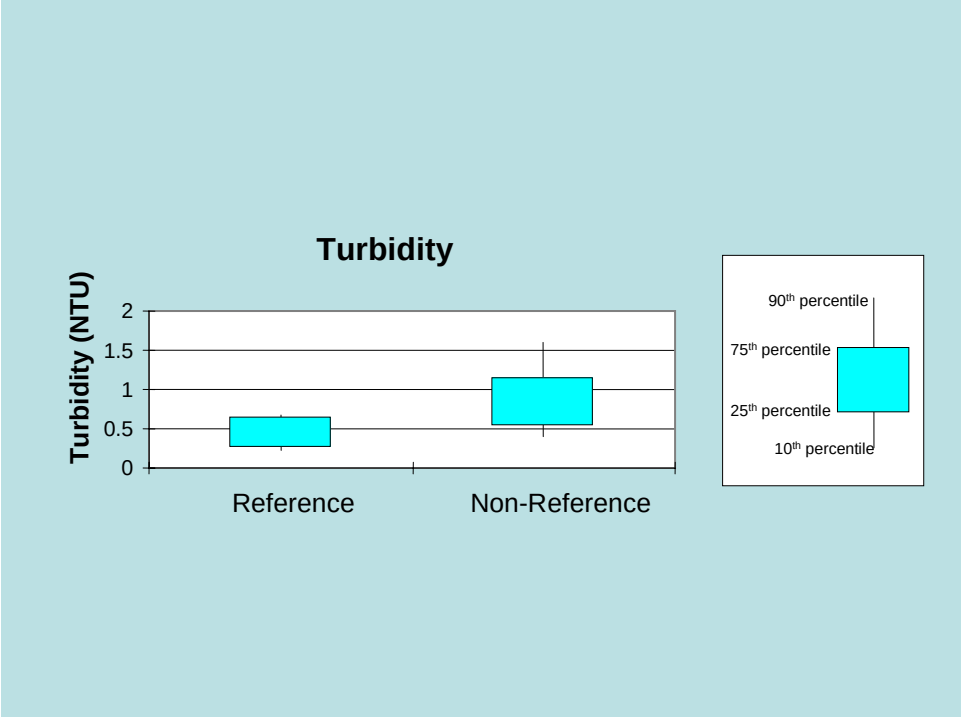


Figure 3

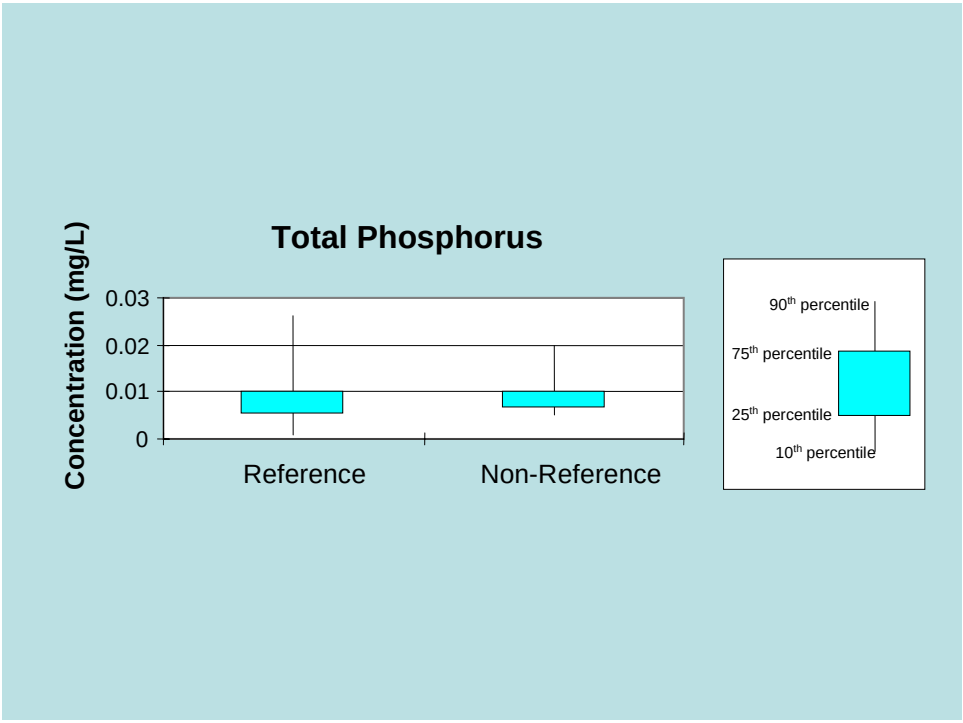


Figure 4

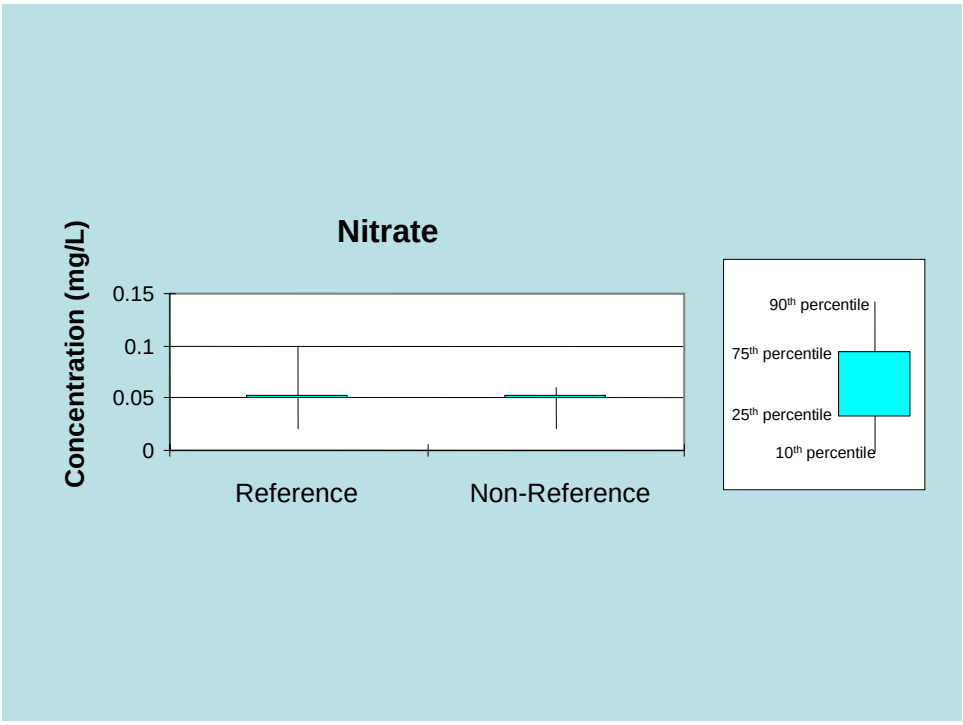
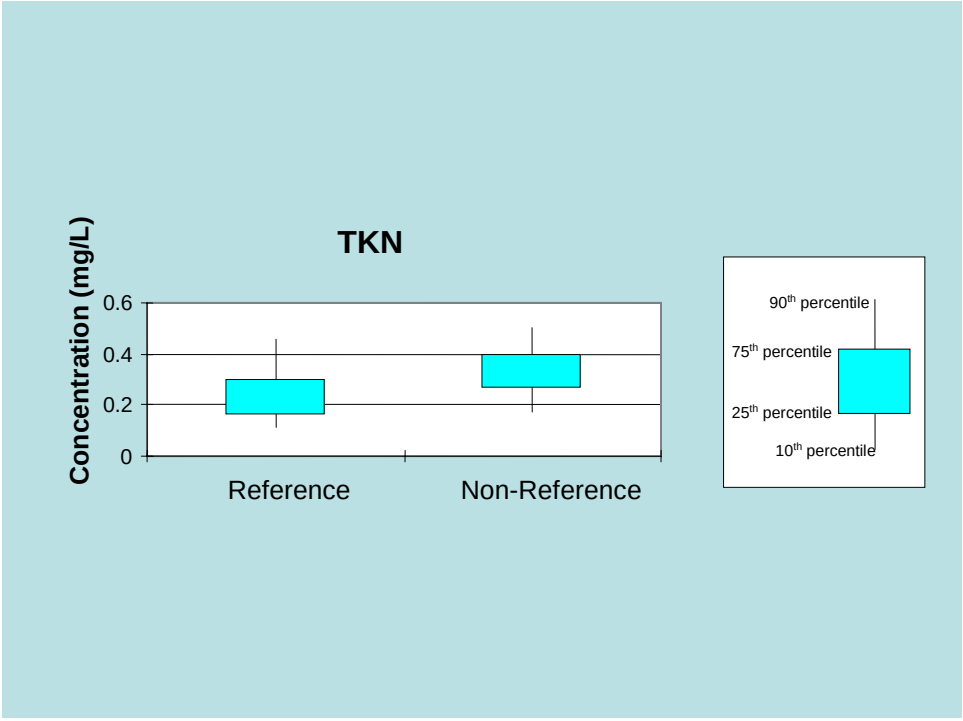


Figure 5



PROPOSAL

DES proposes that, for lakes, values of color, turbidity, nitrogen, and phosphorus that are less than the 75th percentile value of the population of reference lakes be considered "as naturally occurs". A value greater than the 75th percentile would be considered "as naturally occurs" only if a watershed survey determines that there is minimal human activity in the watershed, or there is a dominant natural watershed characteristic causing the value.

The reference population selected for this discussion paper is preliminary, and may change after further analysis. Using this approach and the preliminary reference population, a color value of 20.75 or less, a phosphorus value of .01 mg/l or less, a total nitrogen (=nitrate + TKN) of .35 mg/l or less, and a turbidity of .65 NTU or less would be considered "as naturally occurs" for lakes.

DES would conduct similar analyses for other waterbody types to apply the "naturally occurring" narrative standard to particular waterbodies, as the need arises.